

**INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS MANAGEMENT**

**FIVE-CYCLE SLAKE RESISTANCE TEST ON SHALE
ITM No. 505-08T**

1.0 SCOPE

- 1.1** This test method covers the procedure for determination of the slaking resistance index of a shale, resulting from multiple cycles of drying and wetting.
- 1.2** The values stated in either acceptable English or SI metric units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, SI metric units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other, without combining values in any way.
- 1.3** This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

2.0 TERMINOLOGY. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101, and as follows:

- 2.1** Slaking Resistance Index. The percentage, by weight (mass) retained on a No. 10 (2.00 mm) sieve of an intact, dried specimen of shale when subjected to 5 cycles of drying and soaking for 16 h in a slaking fluid, usually distilled water.

3.0 APPARATUS

- 3.1** Drying oven, thermostatically controlled, capable of maintaining a temperature of $230 \pm 9^{\circ}\text{F}$ ($110 \pm 5^{\circ}\text{C}$)
- 3.2** Balance, sensitive to 0.1 g and having a capacity to weigh 500 g
- 3.3** Miscellaneous apparatus, 600 mL pyrex beakers, distilled water, brush

4.0 TEST SAMPLES.

- 4.1** Each test sample shall be a representative, intact, roughly equidimensional shale fragment having a weight (mass) of 100 to 150 g. Any sharp corners shall be broken off and all dust shall be removed by brushing just prior to weighing.

- 4.2** The samples shall be transported and stored in a manner to retain the natural water content.

5.0 PROCEDURE.

- 5.1** Each sample shall be placed in an individual beaker, weight (mass) determined, then dried in an oven at $230 \pm 9^{\circ}\text{F}$ ($110 \pm 5^{\circ}\text{C}$) for 8 hours or to constant weight (mass) (Note 1). The samples shall be allowed to cool at room temperature for 20 minutes, and then weighed again.

Note 1 - Constant weight (mass) is defined as the weight (mass) at which further drying at the required drying temperature does not alter the weight (mass) by more than 0.05 percent.

Calculate the natural water content as follows:

$$w, \% = \frac{A - B}{B - C} \times 100$$

where:

w = water content, %

A = weight (mass) of breaker and sample at natural moisture content, g

B = weight (mass) of breaker and oven-dried sample, g

C = weight (mass) of beaker, g

- 5.2** Distilled water shall be used to fill each beaker to a height of at least 1/2 in. (13 mm) above the top of the shale. Observations shall be made periodically. If desired, the mechanism of slaking and any variations in slaking rates may be noted.
- 5.3** At the conclusion of 16 h of immersion, the material on each beaker shall be gently washed on a No.10 (2.00 mm) sieve. The material retained shall be washed back into the beaker using distilled water and dried at $230 \pm 9^{\circ}\text{F}$ ($110 \pm 5^{\circ}\text{C}$) in an oven for 8 h or to constant weight (mass).
- 5.4** Repeat steps 5.2 and 5.3 four additional times.

6.0 CALCULATIONS.

6.1 The slaking resistance index for each cycle shall be calculated as follows:

$$I_s, \% = \frac{WF - C}{B - C} \times 100$$

where:

I_s = slaking resistance index, %

WF = weight (mass) of beaker and oven-dried material retained on No. 10 (2.00 mm) sieve after soaking, g

B = weight (mass) of beaker and oven-dried sample, g

C = weight (mass) of beaker, g

7.0 REPORT. The report shall include the following:

7.1 Mean slaking resistance index for each cycle

7.2 Mean natural water content of the shale

7.3 Notes on the mechanism and rate of slaking

7.4 Notes on the variability of slaking between samples

7.5 Notes on the appearance of the unslaked fragments